

# **EPA Superfund Explanation of Significant Differences:**

**CAPE FEAR WOOD PRESERVING  
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FAYETTEVILLE, NC  
09/24/1991**

EXPLANATION OF SIGNIFICANT DIFFERENCE  
IN COMPONENTS OF THE REMEDY  
TO BE IMPLEMENTED AT THE  
CAPE FEAR WOOD PRESERVING SITE  
FAYETTEVILLE, CUMBERLAND COUNTY, NORTH CAROLINA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY  
REGION IV  
ATLANTA, GEORGIA

DATE: 9/24/91

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**INTRODUCTION**

The function of this Explanation of Significant Difference (ESD) is to relate to all parties of concern that the Environmental Protection Agency (EPA) is enacting a significant alteration to a component of the Remedial Action (RA) for the Cape Fear Wood Preserving Superfund site. Requirements and goals of the original RA can be found in the Record of Decision (ROD), dated June 30, 1989, below. The necessity of this modification to the RA is based on information generated as part of treatability studies conducted during the Remedial Design (RD) stage of the Superfund process. This ESD for the Cape Fear site is required under Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

A copy of this ESD will be added to the Cape Fear Wood Preserving Superfund site Administrative Record and Information Repository. Copies of either one can be found in the Cumberland County Public Library or in EPA's, Region IV Information Center. Public access for the purpose of reviewing either the Administrative Record or the Information Repository will be during normal working hours.

**SITE LOCATION AND DESCRIPTION**

The Cape Fear site, near the intersection of latitude 35E02'57"N and longitude 79E01'17"W, is located in Cumberland County, North Carolina, on the western side of Fayetteville near Highway 401. Of the approximately 41 acres comprising the site, less than 10 acres were developed by the facility. The remainder of the site is heavily wooded with coniferous trees with a small swampy area northeast of the developed area. The site is highly disturbed in the vicinity of the plant facilities. The buildings are currently abandoned and in various states of disrepair. The swampy area consists of a seasonally flooded wetland dominated by rushes. The upland section of the site is sandy and well-drained. No endangered flora and fauna species were found during a site survey made in the Summer of 1990.

The terrain of the Cape Fear site is predominantly flat, with drainage provided by a swampy area on the northeast side of the site and a man-made ditch to the southeast that extends southeastwardly to an impoundment that use to be diked. A variety of land uses exist around the Site. The properties to the north include an undisturbed pine forest, a concrete plant,

and a few residential properties. To the east is a continuation of the undisturbed pine forest, and to the west is farmland used for growing crops and raising livestock as well as additional residences. To the south is another concrete plant as well as a subdivision named "Southgate". This subdivision is approximately a quarter of a mile south of the site and houses approximately 1,000 people. Several potable wells within the boundaries of this subdivision supply these homes with drinking water.

#### **SITE HISTORY**

Operations at the Cape Fear Wood Preserving site commenced in 1953 and continued until 1983. Creosote-treated wood was produced from 1953 until 1978 when demand for creosote-treated products declined. Wood was then treated by a wolmanizing process using salts containing sodium dichromate, copper sulfate, and arsenic pentoxide. This treatment process is known as the copper-chromium-arsenic (CCA) process.

Liquid and sludge wastes were generated by both of these treatment processes. Waste from the creosote process was pumped into a concrete sump. As the liquid portion separated from the sludge, it was pumped into a drainage ditch that discharged into a diked pond. Stormwater runoff from the treatment yard also drained into this ditch. Waste from the CCA treatment process was pumped into a unlined lagoon and allowed to percolate into the ground.

In the summer of 1977, the State of North Carolina determined the Site was contaminated with constituents of coal tar and coal tar creosote and ordered the owner/operator to comply with North Carolina law. As a result, the owner/operator changed operations to limit further releases, installed a new potable water well for a neighbor west of the site, and removed 900 cubic yards of creosote-contaminated soil from the treatment yard and the drainage ditch that parallels the railroad. Between 1979 and 1980, a new closed-circuit CCA plant was installed and the old creosote and CCA facilities were decommissioned. The new CCA plant was regulated under the Resource Conservation and Recovery Act (RCRA) as a small generator until 1983, at which time the company went out of business. The Site remained unchanged until the summer of 1988 at which time SECo, Investment, Inc. purchased the property.

In the fall of 1988 and at the direction of a Cumberland County building/construction inspector, the owner of the property retrenched the majority of the drainage ditch, dug several new

drainage trenches and breached the diked pond. Both the drainage ditch and the sediments within the drainage ditch and the diked pond and the sediments within the diked pond were areas targeted for remediation.

EPA conducted a site reconnaissance and site investigation in October 1984. Surface water, groundwater, soil, and sediment samples were collected from the northeast swamp, the diked pond, the lagoon, the drainage ditch and a domestic well west of the Site (S.T. Jackson). Polycyclic aromatic hydrocarbons (PAHs), which are creosote-related compounds, and the CCA metals were detected in all samples. Consequently, EPA conducted an emergency removal action at the Site in January and February 1985. This action included:

- \* Removal of creosote sludge from the-creosote concrete sump;
- \* Removal of sludge from the lagoon to a depth of 7 feet, and solidification of the sludge with fly ash;
- \* Pumpage of lagoon water into storage tanks located south of the new CCA unit;
- \* Removal of contaminated soil from the drainage ditch that parallels the railroad tracks and at the culvert near Reilly Road;
- \* Removal of contaminated soils from a portion of the northeast swamp and stained areas in the treatment yard; and
- \* Back filling with clean sandy soil of areas where contaminated soil had been removed.

All contaminated soils and sludges taken from the Site as part of this removal action were transported to the GSX hazardous waste landfill in Pinewood, South Carolina.

In May and October of 1985, additional soil, sediment, surface water, and ground water samples were collected for analyses. The analytical results again showed the presence of PAHs, arsenic, chromium, and copper.

EPA conducted a second emergency response in September 1986 when a Site visit revealed that vandals had shot holes in a 3,000-gallon creosote storage tank spilling approximately 500 gallons of creosote on the ground. The cleanup operation consisted of:

- \* Solidification and storage of approximately 10 cubic yards of creosote-contaminated sludge under an on-site metal shed;

- \* Removal and transport of the creosote storage tank to the on-site metal shed;
- \* Excavated and regraded area where the creosote tank had leaked;
- \* Pumped approximately 15,000 gallons of CCA waste water from the CCA recovery sump into on-site storage tanks; and
- \* Construction of an earthen dike around a portion of the CCA recovery sump.

The Site was proposed for the National Priorities List (NPL) in June 1986 and was finalized in July 1987 as site number 572. A Remedial Investigation (RI) and a Feasibility Study (FS) were completed in October 1988 and February 1989, respectively. The ROD, signed in June 1989, specified the following remedial action:

#### Remediation of Hazardous Materials, Tanks and Piping

- Off-site disposal of sodium dicromate - copper sulfate - arsenic pentoxide (CCA) salt crystals, the solidified creosote and asbestos-containing pipe insulation. The CCA crystals and solidified creosote will be disposed of at a RCRA permitted landfill. The asbestos-containing pipe insulation will be disposed of at the Cumberland County Solid Waste Facility pursuant to the facilities specifications.
- The tanks and associated piping, above and below ground, will be emptied, flushed and cleaned, including triple rinsing, to render the metal non-hazardous. The metal will then be cut and either sold to a local scrap metal dealer or disposed of at the Cumberland County Solid Waste Facility. For those tanks and/or piping that cannot be cleaned sufficiently to render them non-hazardous they will be transported to a RCRA permitted landfill for disposal.
- The contents of the tanks and associated piping contains approximately 50,000 gallons of 3 percent CCA solution and 15,000 gallons of CCA contaminated wastewater. A buyer of the 50,000 gallons of 3 percent CCA solution will first be pursued. If no buyer can be found, then the 50,000 gallons of 3 percent (3%) CCA solution along with the 15,000 gallons of CCA contaminated wastewater will be treated on-site through the water treatment system set up for treating the pumped surface waters and extracted groundwater. All wastewater (i.e., cleaning equipment, etc.) generated by on-site activities will also be directed to the treatment system.

#### Source Control (Remediation of Contaminated Soils)

- The preferred alternative for the remediation of contaminated soils/sediment is soil washing. The alternate source control alternative is a low thermal desorption process to remove the organics contaminants from the soil followed by either soil washing or a soil fixation/solidification/stabilization process to address the inorganics. The decision as to which source control alternative will be implemented will be based on data generated by the soil washing treatability study to be conducted during the remedial design.
- Contaminated soils/sediment will be excavated, treated and placed back in the excavation. All wastewater generated will either be reused or treated on-site. Following completion of on-site remedial activities, those areas disturbed will be revegetated

#### Migration Control (Remediation of Contaminated Groundwater)

- Groundwater extraction will be accomplished through the use of well points in the upper (surficial) aquifer. Groundwater removal will be conducted in 10,000 square foot subareas at a time, until the entire contaminated surficial aquifer is addressed. The well points will be moved from one area to another for subsequential dewatering.
- Due to local contamination of the lower aquifer, the lower aquifer will be pumped following remediation of the overlying upper aquifer in this area. This will prevent potential contaminant drawdown to deeper depths.
- A water treatment system will be established on-site. The system's influent will include contents of the tanks and piping, all wastewater generated due to remedial actions implemented, pumped surface water, and extracted groundwater. The level and degree of treatment will depend on 1) the level of contaminants in the influent and 2) the ultimate discharge point of the treated water. There are two water discharge alternatives for the treated water. The optimal choice is the local sewer system. The other alternative is to discharge the effluent to a surface stream. The range of treatment for the contaminated water includes biological degradation, air stripping, filtration through activated carbon filters, and metal removal through flocculation, sedimentation and precipitation. The point of discharge and the degree of treatment will be determined in the Remedial Design stage. The effluents, including both discharged water and/or air, will meet all applicable and relevant or appropriate requirements (ARARs).

**DESCRIPTION OF SIGNIFICANT DIFFERENCE AND BASIS FOR THE DIFFERENCE**

The issuance of this ESD is warranted for the following reasons:

- B the selection of soil washing over low thermal desorption as the primary remedial technology to address soil contamination at the Site;
- B the possible need for solidification of some soil using a cement/ash mixture to address the elevated concentrations of the metals, arsenic and chromium;
- B the selection of activated carbon adsorption as the primary treatment technology for all contaminated water;
- B the potential need for pretreatment of the contaminated water stream to remove suspended solids and oxidized iron prior to activated carbon filtration; and
- B the selection of Bones Creek as the discharge point for the treated water.

Each item above is discussed in greater detail below.

The Remedial Design (RD) was initiated following the signing of the ROD and was completed in September 1990. The design is performance based requiring the Remedial Action (RA) contractor to achieve the cleanup goals for each identified contaminant in each environmental medium specified in the ROD. Associated with the Cape Fear RD were two separate treatability studies. The decisions made during the RD, the findings of the first treatability study, and the unanticipated results obtained in the second treatability study precipitated the need for this ESD.

The first treatability study consisted of two phases and was completed in the summer of 1990. The first phase, Phase I, investigated the following questions: 1) is soil washing an applicable technology for this Site and 2) will low thermal desorption work at the Site? The second phase, Phase II, examined the effectiveness and stability of solidification of the contaminated soil fines generated by the soil washing process. This phase also investigated the optimum ratios of cement-to-fly ash and mixture-to-soil. Below is a synopsis of the first treatability study.

Eight soil washing tests using various parameters was conducted as part of Phase I. Data for three of these tests showed that the soil washing process under specific conditions could generate "clean soil" that met the cleanup goals for the chemicals of



concern. The chemicals of concern in the soil and ditch sediment are carcinogenic and non-carcinogenic PAHs and the metals, arsenic and chromium. The data for these three tests and the ROD specified cleanup goals are presented in Table 1.

In each of these three tests, cleanup goal levels were achieved for the chemicals of concern in the "Washed Soil". The only washing parameter changed between Test Number 5 and Test Number 6 was the pH of the wash solution. For Test Number 5, the washing solution was made basic by adding sodium hydroxide (NaOH) until a pH of 10 was obtained. In Test 6, the washing solution was made acidic by adding hydrochloric acid (HCl) until a pH of 4 was obtained. For Test Number 8, the pH of the washing solution was maintained at pH 7, neutral, and Triton X-100, a commercially manufactured surfactant, was added at a rate of 1 pound per ton of raw soil. Triton X-100 was not added in either Test 5 or 6.

As stated above, the ROD called for the use of either soil washing to remove all contaminants from the soils and ditch sediments or low thermal desorption to remove the organic contaminants (i.e., PAHs) and either soil washing or soil solidification/fixation to address the inorganics (i.e., arsenic and chromium). The results of the first treatability study and cost estimates for the various technologies were presented in a meeting held July 11, 1990. Based on the information presented, the Agency and the State of North Carolina, mutually agreed on which remediation technology was to be employed at the Cape Fear site. Soil washing was selected over low thermal desorption as this approach would significantly lower the overall cost of the RA.

In addition to selecting the soil washing process, a tentative treatment scheme for handling the contaminated soil fines generated by the soil washing process was also identified in the July 11, 1990 meeting. The preferred approach included metallurgical leaching to remove and further concentrate the metals and biodegradation to destroy the organics. However, it was acknowledged that additional information was needed to determine if either technology would work at the Site. As a result, both soil solidification and low thermal desorption remained as viable alternatives in the event the metals could not be leached from the soil fines and bioremediation failed to achieve the destruction of the organics. To address these unknowns, a second treatability study, Phase III, was initiated.

Two other decisions were made during this same time frame: how to treat the contaminated wastewater and where to discharge the wastewater after treatment. The wastewater will be comprised of pumped contaminated surface water and groundwater, contaminated water coming from the soil washing process, and the aqueous

Test Number	Media	pH	Reagent	CONTAMINANT			
				Arsenic	Chromium (total)	PAHs (total)	PAHs (carcinogenic)
	Raw Soil	N/A	N/A	289 mg/kg	195 mg/kg	99.8 mg/kg	11.1 mg/kg
5	Washed Soil	10	NaOH	64.4 mg/kg	51 mg/kg	5.1 mg/kg	1.7 mg/kg
5	Fines	10	NaOH	2,353 mg/kg	940 mg/kg	39.7 mg/kg	3.5 mg/kg
5	Wash Water	10	NaOH	1.2 mg/l	1.2 mg/l	367 ug/l	54.9 mg/l
6	Washed Soil	4	HCl	52.2 mg/kg	44.2 mg/kg	5.1 mg/kg	1.8 mg/kg
6	Fines	4	HCl	1,117 mg/kg	847 mg/kg	22.7 mg/kg	8.6 mg/kg
6	Wash Water	4	HCl	0.1 mg/l	0.1 mg/l	358.8 ug/l	104.2 mg/l
8	Washed Soil	7	Triton	54.7 mg/kg	58 mg/kg	5.7 mg/kg	1.5 mg/kg
8	Fines	7	Triton	1,297 mg/kg	894 mg/kg	21 mg/kg	5.4 mg/kg
8	Wash Water	7	Triton	0.2 mg/l	0.2 mg/l	312.2 ug/l	59.7 mg/l
Cleanup Criteria for Soil				94 mg/kg	88 mg/kg	100 mg/kg	2.5 mg/kg

TABLE 1 Summary of Analytical Data for Soil Washing Test  
That Achieved Cleanup Goals in Phase I and  
Cleanup Goals for Contaminants of Concern

stream emanating from the bioremediation reactor. The wastewater is anticipated to contain volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), low levels of metals, and suspended solids. Because the contaminated water will contain both VOCs and SVOCs, activated carbon adsorption was selected as the primary treatment process. However, the performance of activated carbon filters can be adversely impacted by the presence of elevated concentrations of suspended solids and oxidized iron. Even though the groundwater is low in suspended solids, the total amount of suspended solids will be increased due to the effluent from the bioremediation process. In addition, relatively high iron concentrations were observed in the groundwater. Therefore, the water treatment system may also need to remove suspended solids and iron prior to the activated carbon filtration step.

Any solids/sludge generated as a result of this pretreatment is anticipated to be non-hazardous and therefore, will be disposed of at a local, non-hazardous landfill. Samples will be collected and analyzed to confirm that these solids/sludge are non-hazardous.

The effluent generated at the Site will be discharged to Bones Creek. Based on discussions with the City of Fayetteville Public Works Commission, in order to discharge the effluent to the nearest publicly owned treatment works (POTW), Rockfish Wastewater Treatment Plant, the water from the Site would require rigorous metal treatment otherwise the local POTW would not be able to meet its own effluent disposal requirements. The need for metal treatment made this option the most costly.

Two other discharge options were also evaluated. The first option was the on-site ditch and the second, Bones Creek. Because the on-site ditch has zero flow, effluent criteria to the ditch would be very stringent. Bones Creek has a 9 cubic feet per second flow, therefore, the discharge criteria would be less stringent due to stream mixing. Consequently, Bones Creek was selected as the receiving stream for the effluent from the Site even though the initial capital cost for discharging to Bones Creek will be higher. The higher capital cost results from the need to construct a 5,000 foot outfall pipe from the Site to Bones Creek. However, the overall remediation cost will be lower than the cost of discharging to the on-site ditch as the operation and maintenance costs associated with a metal treatment process are eliminated.

Due to the distance from the Site that the treated water will be discharged, a National Pollutant Discharge Elimination System (NPDES) permit will be required. The acquisition of the NPDES permit will be the responsibility of the RA contractor.

The second treatability study, Phase III, was conducted between January and July 1991. The objectives of this treatability study were to confirm Phase I findings and provide additional data that would be helpful to the RA contractor in implementing the RD, especially with respect to dealing with the contaminated soil fines that would be generated by the soil washing process. Phase III was a multi-component treatability study.

A primary goal of Phase III was to determine whether or not a combination of soil washing, metallurgical leaching, and biodegradation processes could be used to remediate the contaminated soils at the Site to the cleanup goals specified in the ROD. The purpose of the soil washing phase was to confirm the results of the first treatability study as well as identify optimum soil washing conditions. The objective of the metallurgical leaching study was to determine whether or not arsenic and chromium could be leached from the contaminated soil fines generated by the soil washing process; and if so, to identify the important controlling parameters of the leaching process. The main function of the biodegradation study was to determine if an aerobic soil bacteria culture could successfully feed on the PAHs resulting in the destruction of the PAHs. The findings of Phase III are summarized below.

One known alteration in the soil washing processes used in Phase I and Phase III was the soil to solution ratio. In Phase I, a ratio of 1.2:1 was used while in Phase III, a ratio of 1:1 was employed. Other minor deviations may have been the diameter of the mixing vessels, the type of impellers, and the depth at which the impellers were placed within the mixing vessels. None of these changes highlighted above should have had a significant impact on the results. The only other known difference was the laboratory used to run the analyses. This change may have had an impact on the results.

Phase III data confirms that the soil washing process can achieve cleanup goals for PAHs in the "Cleaned Soil" fraction; however, Phase III data contradicts the results obtained in Phase I for the two metals, arsenic and chromium. In all four (4) Phase III soil washing trails, the levels of arsenic and chromium remained above the cleanup goals of 94 mg/kg and 88 mg/kg, respectively, in the "clean soil" portion with the exception of Test Number CFW410. In this test, chromium had a concentration of 87.5 mg/kg. The analytical results for metals obtained in the Phase III soil washing tests are presented in Table 2.

As can be seen in comparing results, neither increasing the number of washing stages nor the addition of Triton X-100 significantly improved the removal of the metals from the "clean

soil" portion. The best results were obtained by increasing the pH of the washing solution to 10 using sodium hydroxide. In this test, the clean up goal for chromium was obtained, 87.5 mg/kg, but not for arsenic, 113 mg/kg.

The goals of the soil fines leaching study were to determine 1) if leaching arsenic and chromium out of the soil fines generated by the soil washing process was feasible and 2) the most cost efficient leaching process. Different leaching solutions were tested but none were able to obtain cleanup levels in the soil fines for arsenic and chromium. The results, presented in Table 3, show that the levels of arsenic and chromium in the soil fines remained significantly above the clean-up goals in every test. The best results were obtained under vigorous leaching conditions, pH<1 and heating the solution. This denotes that the metals are very strongly bound to the clay particles at the Site. Therefore, it appears to be impractical to leach these two metals from the soil fines.

In addition to the work summarized above, toxic characteristic leaching procedure (TCLP) tests were also performed on the raw soil and the soil fines. The soil fines present the worse case scenario as the contaminants were concentrated in the soil fines by the soil washing process. The TCLP test is a test used to determine if a material is classified as a Resource Conservation and Recovery Act (RCRA) characteristic waste. The results showed that concentrations of arsenic and chromium in the leachate ranged from one to almost three orders of magnitude below the allowable maximum regulatory levels. Therefore, neither the raw soil nor the soil fines fall into the category of a characteristic waste. The TCLP data and the allowable regulatory levels are presented in Table 4.

Even though Phase III was unable to confirm the findings of Phase I with respect to meeting the clean-up goals for arsenic and chromium in the "clean soil" portion, both phases showed that the soil washing process did reduce the volume of soil by approximate 90 percent. Therefore, the approximate 20,000 to 24,000 cubic yards of contaminated soil and ditch sediment at the Site can be reduced to 2,000 - 2,400 cubic yards of highly contaminated soil fines.

The biodegradation testing showed that aerobic bacteria can subsist in either the raw, untreated soil, or in the soil fines but due to time constraints, the overall effectiveness of the bacteria destroying the PAHs could not be determined. The average total PAH level in the soil fines was 306 mg/kg with 44 mg/kg of carcinogenic PAHs. In 18 days, biodegradation was able to reduce these levels to 50 mg/kg and 14 mg/kg for total and carcinogenic PAHs, respectively. Although the actual

Sample ID/ Test Number	Arsenic (mg/kg)	Chromium (mg/kg)	Number of Washing Stages	Reagent
CFRS001 (Raw Soil)	195	192	N/A	N/A
CFWSH01C	145	120	3	None
CFWST01C	132	111	3	Triton
CFWS4N4	136	106	4	None
CFWS410	113	87.5	4	NaOH
Cleanup Goals	94	88	N/A	N/A

TABLE 2 Metal Concentrations in the "Cleaned Soil" for the Four Soil Washing Trails Conducted During Phase III

Concentrations Remaining in Soil Fines After Leaching Procedure										
Metals (ug/kg)	Concen- trations in Raw Fines Soil									Cleanup Goals
		pH9	pH10	pH11	pH12	pH12 and oxidant	pH2	pH2 and oxidant	pH<1 Heated	
Arsenic	2,050	1,660	1,620	1,770	1,810	1,660	2,080	1,650	180	94
Chromium	1,410	1,620	1,700	1,740	1,450	1,670	1,390	1,580	420	88

TABLE 3 Summary of Concentrations of Arsenic and Chromium Remaining  
in the Soil Fines Following Leaching Under Several Conditions

Sample ID	Soil Type	Arsenic (mg/l)	Chromium (mg/l)	Allowable Concentration
CFTCLT-B	Raw	0.249	ND	5
CFTCLP-F	Fines	0.238	0.05	5

TABLE 4 TCLP Result for Raw Soil and Soil Fines

remediation goal (2.5 mg/kg) was not obtained for carcinogenic PAHs, the results suggest that a longer incubation period would result in further reduction of PAHs to below cleanup goals.

The significance of the findings of Phase III is that the major benefit of employing soil washing, reducing the volume of soil that needs to be treated, may not be completely obtained. In other words, the "clean soil" portion may contain elevated levels of metals. In deciding on what action to take, the Agency reevaluated a number of key factors.

The first factor to consider is that the soil washing process in Phase I did obtain the cleanup goals for all contaminants of concern. Results of Phase III cannot alter this fact and no error has been identified in the work or data associated with Phase I.

Secondly, the soil samples used in both treatability studies were to represent a worse case scenario and therefore, these samples were collected from the most contaminated areas of the Site. During actual RA operations, lower levels of metals will be typically encountered in the raw soil. The average percent removal for arsenic and chromium obtained in the Phase III soil washing tests were 32 percent and 44 percent, respectively. Based on these removal rates, cleanup goals would be obtained in the "clean soil" portion if the initial concentrations of arsenic and chromium in the raw soil does not exceed 138 mg/kg and 167 mg/kg. Based on a review of the analytical data generated during the RI and RD, only limited areas of the Site exceed these values. Therefore, the soil washing process will likely generate clean soil that will meet the specified cleanup goals.



Thirdly, the soil washing data, the TCLP data, and the leaching study findings show that the metals are strongly bounded to the clay particles/fines at the Site. This implies that even if the soils were left in place, the metals would not migrate and impact groundwater. In addition to this fact, the risk assessment formulated in the RI, determined that these metals would only pose a threat to either the environment or the public if there was direct exposure. Direct exposure pathways include dermal contact with soils and inhalation of contaminated fugitive dust. By removing these pathways, the risks posed by arsenic and chromium are eliminated.

It is for this reason, in addition to resolving the contingencies in the Cape Fear ROD, that this ESD has been prepared. Based on the information obtained from the second treatability study, Phase III, it appears that some "clean soil" and the bioremediatedly treated soil fines may retain elevated levels of arsenic and/or chromium. In the event that any particular batch(es) of either "clean soil" or treated soil fines do not obtain the remediation goals for arsenic and/or chromium, then these soils will be segregated in an on-site excavation and covered with a layer of clean soil as part of the revegetation process called for in the Cape Fear ROD. This clean soil cap and revegetation will eliminate all risks posed by the presence of these elevated levels of metals by eliminating the direct contact exposure pathways.

In the event unacceptable elevated levels of arsenic and/or chromium are found in the soil fines, data generated as part of Phase II of the first treatability study showed that the soil fines can be successfully solidified. Table 5 presents TCLP data for tests ran on solidified soil fines. Under each solidification scenario, the levels of both arsenic and chromium in the TCLP leachate were below the regulatory limits. The regulatory limit for both arsenic and chromium is 5 mg/l as specified in the promulgated Toxicity Characteristics Rule (55 FR 11798, March 29, 1990).

#### **AFFIRMATION STATUTORY DETERMINATIONS**

Considering the new information that has been developed and the changes that have been made to the selected remedy, the Agency and the State of North Carolina Department of Environment, Health, and Natural Resources believe that the remedy remains protective of human health and the environment, compiles with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site.

Group/ Sample Number	Cement to Fly Ash Ratio (by weight)	Mixture to Soil Ratio (by weight)	Number of Days Cure	TCLP Data for Contaminant (mg/l)			Permeability ( $\times 10^{-7}$ )	UCS (psi)
				Arsenic	Chromium	PAHs		
A/1	40/60	.5	7	<0.20	0.10	<0.031	N/A	N/A
A/2	40/60	.5	14	<0.20	<0.05	<0.029	N/A	N/A
A/3	40/60	.5	28	<0.20	<0.12	<0.028	3.3	88
A/4	40/60	.5	28	N/A	N/A	N/A	3.3	N/A
A/5	40/60	.5	28	N/A	N/A	N/A	N/A	88
B/6	50/50	.5	7	<0.20	<0.050	0.031	N/A	N/A
B/16	50/50	.5	7	<0.20	0.090	0.027	N/A	N/A
B/7	50/50	.5	14	<0.20	<0.050	0.030	N/A	N/A
B/17	50/50	.5	14	<0.20	<0.050	0.030	N/A	N/A
B/8	50/50	.5	28	<0.20	<0.050	0.028	N/A	N/A
B/18	50/50	.5	28	<0.20	<0.11	0.027	N/A	N/A
B/9	50/50	.5	28	N/A	N/A	N/A	2.6	N/A
B/19	50/50	.5	28	N/A	N/A	N/A	3.1	N/A
B/10	50/50	.5	28	N/A	N/A	N/A	N/A	206
B/20	50/50	.5	28	N/A	N/A	N/A	N/A	122
C/11	50/50	.6	7	<0.020	0.090	0.028	N/A	N/A
C/12	50/50	.6	14	<0.020	<0.050	0.029	N/A	N/A
C/13	50/50	.6	28	<0.020	<0.050	0.024	N/A	N/A
C/14	50/50	.6	28	N/A	N/A	N/A	0.93	N/A
C/15	50/50	.6	28	N/A	N/A	N/A	N/A	319
Regulatory Levels/Limits				5.0	5.0	N/A		

TABLE 5 Summary of Data from Solidification Parameters and TCLP Tests  
Ran on Soil Fines Generated By Soil Washing

**PUBLIC PARTICIPATION ACTIVITIES**

This ESD will be added to the Cape Fear Wood Preserving Superfund site Administrative Record. Copies of the Administrative Record are kept at

Cumberland County Public Library & Information  
Center  
300 Maiden Lane  
Fayetteville, North Carolina 28301

and

Environmental Protection Agency  
Region IV - Records Center  
345 Courtland Street, N.E.  
Atlanta, Georgia 30365.

These Records are available for public review during normal working hours.

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Date

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Greer C. Tidwell  
Regional Administrator